

CLAIMS

What is claimed is:

1. A water-soluble thioester or selenoester compound comprising an
5 amino acid synthon having an N-terminal group joined to a C-terminal group
through an organic backbone, wherein said C-terminal group is joined to a water-
soluble polymer through a thioester or a selenoester.
2. The thioester or selenoester compound according to Claim 1,
10 wherein said amino acid synthon comprises two or more amino acid residues.
3. The thioester or selenoester compound according to Claim 2,
wherein one or more of said amino acid residues comprises a reactive functional
group.
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4. The thioester or selenoester compound according to Claim 3,
wherein one or more of said reactive functional groups is protected.
5. The thioester or selenoester compound according to Claim 1,
20 wherein said N-terminal group comprises an amino acid residue.
6. The thioester or selenoester compound according to Claim 5,
wherein said N-terminal group comprising said amino acid residue is protected.
- 25 7. The thioester or selenoester compound according to Claim 5,
wherein said N-terminal group comprising said amino acid residue comprises a
moiety capable of supporting chemical ligation.
8. The thioester or selenoester compound according to Claim 7,
30 wherein said moiety capable of supporting chemical ligation comprises an atom
selected from the group consisting of sulfur and selenium.

9. The thioester or selenoester compound according to Claim 8, wherein said atom is comprised in an amino acid residue selected from the group consisting of cysteine and selenocysteine.

10. The thioester or selenoester compound according to Claim 9, wherein said cysteine and selenocysteine is protected.

11. The thioester or selenoester compound according to Claim 1, wherein said C-terminal group comprises an amino acid residue.

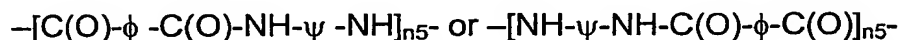
12. The thioester or selenoester compound according to Claim 11, wherein said amino acid residue comprises an alpha-carbonyl of an ester of the formula $-C(O)-X-$, wherein X is sulfur or selenium.

13. The thioester or selenoester compound according to Claim 12, wherein said ester is said thioester or selenoester.

14. The thioester or selenoester compound according to Claim 1, wherein said water-soluble polymer comprises one or more alkylene oxide moieties.

15. The thioester or selenoester compound according to Claim 14, wherein said water-soluble polymer comprising said one or more alkylene oxide moieties comprises a polyamide.

16. The thioester or selenoester compound according to Claim 15, wherein said polyamide comprises a moiety comprising the formula:



wherein ϕ and ψ are divalent radicals that may be the same or different, and at least one of ϕ and ψ is water-soluble repeat unit that may be linear or branched; and n_5 is a discrete integer.

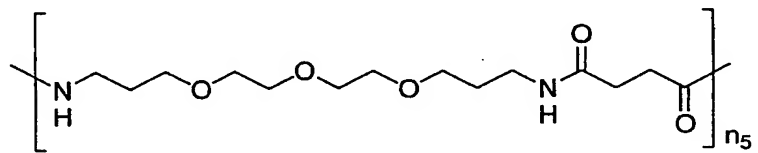
17. The thioester or selenoester compound according to Claim 16, wherein one or both of ϕ and ψ is chosen from $-((\text{CH}_2)_{n_6}-\text{(CH}_2\text{-CH}_2\text{-O)}_{n_7}-\text{(CH}_2)_{n_6})-$ and $-((\text{CH}_2)_{n_6}-\text{(O-CH}_2\text{-CH}_2)_{n_7}-\text{(CH}_2)_{n_6})-$, wherein n_6 is 0 to 6; and n_7 is 1 to 50.

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18. The thioester or selenoester compound according to Claim 17, wherein ϕ is $-(\text{CH}_2\text{-CH}_2)-$, and ψ is $-(\text{CH}_2-(\text{CH}_2\text{-CH}_2\text{-O})_3\text{-CH}_2\text{-CH}_2\text{-CH}_2)-$ or $-(\text{CH}_2\text{-CH}_2\text{-CH}_2-(\text{O-CH}_2\text{-CH}_2)_3\text{-CH}_2)-$.

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19. The thioester or selenoester compound according to Claim 18, wherein said water-soluble polymer comprises a divalent radical of the formula:



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20. The thioester or selenoester compound according to Claim 1, wherein said thioester or selenoester is sterically hindered.

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21. The thioester or selenoester compound according to Claim 1, wherein said water-soluble polymer is joined to said thioester or selenoester through a linker comprising a multivalent radical.

22. The thioester or selenoester compound according to Claim 21, wherein said multivalent radical is a divalent radical.

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23. The thioester or selenoester compound according to Claim 22, wherein said divalent radical is substituted with one or more groups that sterically hinder said thioester or selenoester.

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24. The thioester or selenoester compound according to Claim 22, wherein said thioester or selenoester comprises said divalent radical.

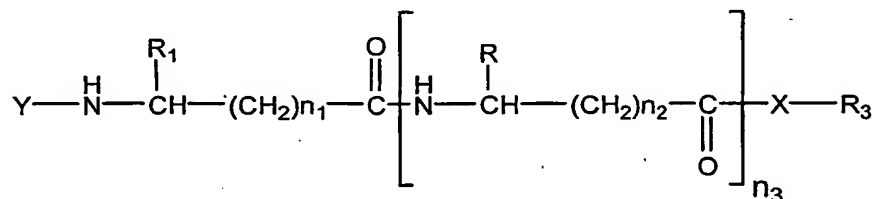
25. The thioester or selenoester compound according to Claim 22, wherein said water-soluble polymer comprises said divalent radical.

26. The thioester or selenoester compound according to Claim 1, wherein said water-soluble polymer is mono-disperse.

27. The thioester or selenoester compound according to Claim 1, wherein said amino acid synthon is mono-disperse.

28. The thioester or selenoester compound according to Claim 1, wherein said thioester or selenoester compound is mono-disperse.

29. A thioester or selenoester compound comprising the formula:



wherein Y is a target molecule of interest that may be present or absent; R₁ is hydrogen or an organic side chain; each R individually is hydrogen or an organic side-chain; n₁ and n₂ each are from 0 to 2; n₃ is from 0 to 100; X is sulfur or selenium; and R₃ is any group compatible with thioesters or selenoesters that includes a water-soluble polymer.

30. The thioester or selenoester compound according to Claim 29, wherein Y comprises an N-terminal group that is protected.

31. The thioester or selenoester compound according to Claim 29, wherein one or more of Y, R₁ and R comprise a moiety that is protected.

32. The thioester or selenoester compound according to Claim 29, wherein Y comprises an N-terminal group having a moiety capable of supporting chemical ligation.

5 33. The thioester or selenoester compound according to Claim 29, wherein Y is an amino protecting group, and R₁ comprises a moiety capable of supporting chemical ligation.

10 34. The thioester or selenoester compound according to Claim 29, wherein R₃ comprises a water-soluble polymer having one or more alkylene oxide moieties.

15 35. The thioester or selenoester compound according to Claim 34, wherein said water-soluble polymer comprising said one or more alkylene oxide moieties comprises a polyamide.

36. The thioester or selenoester compound according to Claim 29, wherein the ester group -C(O)-X- of said formula is sterically hindered.

20 37. The thioester or selenoester compound according to Claim 36, wherein one or more of R, R₁ and R₃ comprises a group that sterically hinders said ester group -C(O)-X-.

25 38. The thioester or selenoester compound according to Claim 29, wherein R₃ is joined to X through a multivalent radical.

39. The thioester or selenoester compound according to Claim 38, wherein said multivalent radical is a divalent radical.

30 40. The thioester or selenoester compound according to Claim 39, wherein said divalent radical is substituted with one or more groups that sterically hinder said thioester or selenoester.

41. The thioester or selenoester compound according to Claim 29, wherein said water-soluble polymer is mono-disperse.

42. The thioester or selenoester compound according to Claim 29,
5 wherein n_1 , n_2 , and n_3 are each 0 or discrete integers.

43. The thioester or selenoester compound according to Claim 29, wherein Y is mono-disperse.

10 44. The thioester or selenoester compound according to Claim 29, wherein said thioester or selenoester compound is mono-disperse.

45. A method of making a thioester or selenoester compound, said method comprising:

15 (a) providing a thioester or selenoester generator comprising an amino acid synthon having an N-terminal group joined to a C-terminal group through an organic backbone, said C-terminal group comprising a moiety joined to a water-soluble polymer through a thioester or selenoester, and said amino acid synthon comprising a linker cleavable under non-nucleophilic conditions that is joined to a
20 support; and

(b) cleaving said linker under non-nucleophilic conditions to produce said thioester or selenoester compound free of said support.

46. The method according to Claim 45, wherein said linker is attached to
25 said amino acid synthon through said water-soluble polymer.

47. The method according to Claim 45, wherein said amino acid synthon comprises one or more backbone nitrogens, and said linker is attached to a backbone nitrogen of said amino acid synthon.

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48. The method according to Claim 47, wherein said N-terminal group of said amino acid synthon comprises said backbone nitrogen.

49. The method according to Claim 47, wherein said organic backbone of said amino acid synthon comprises said backbone nitrogen.

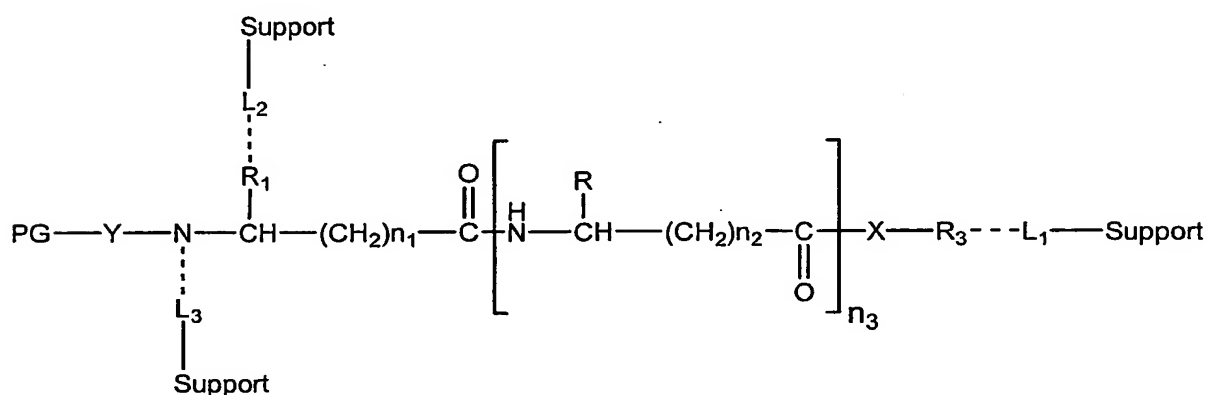
50. The method according to Claim 45, wherein said amino acid synthon comprises one or more side chains, and said linker is attached to a side chain of said amino acid synthon.

51. The method according to Claim 50; wherein said organic backbone of said amino acid synthon comprises said side chain.

52. The method according to Claim 50, wherein said C-terminal group of said amino acid synthon comprises said side chain.

53. A method of making a thioester or selenoester compound, said method comprising:

(a) providing a thioester or selenoester generator comprising a composition having the formula:

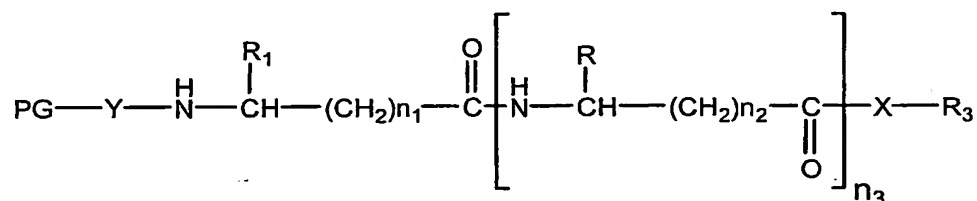


wherein PG is a protecting group that maybe present or absent, Y is a target molecule of interest and may be present or absent, and when Y is absent PG is an amino protecting group that may be present or absent; R₁ and each R individually is hydrogen or an organic side chain; R₃ is a water-soluble polymer; X is sulfur or selenium; n₁ and n₂ each are from 0 to 2; n₃ is from 0 to 100; each L₁, L₂ and L₃ is a linker cleavable under non-nucleophilic conditions; and Support is a

solid phase, matrix or surface; and wherein only one of L₁, L₂, and L₃ is present; and

(b) cleaving said linker under non-nucleophilic conditions to generate a thioester or selenoester compound comprising the formula:

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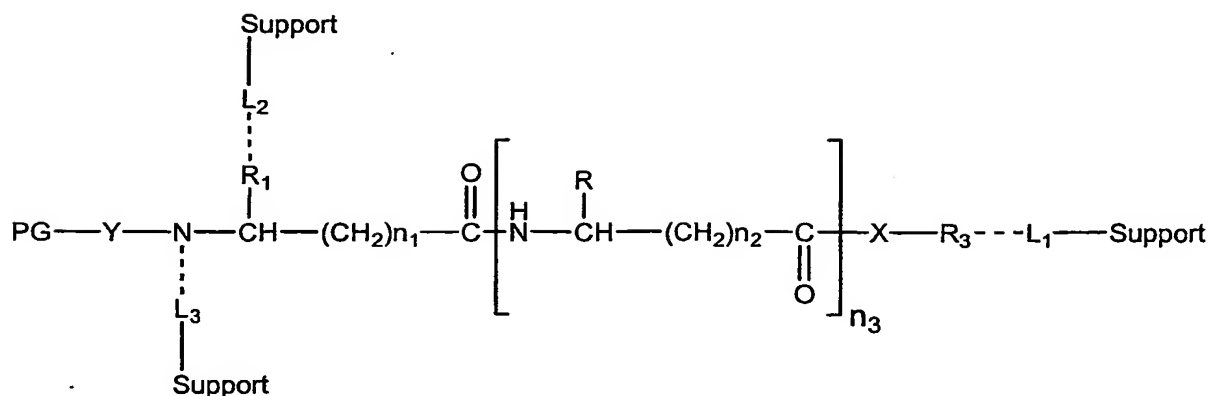


wherein PG is a protecting group that maybe present or absent, Y is a target molecule of interest and may be present or absent, and when Y is absent
 10 PG is an amino protecting group that may be present or absent; R₁ and each R individually is hydrogen or an organic side chain; R₃ is a water-soluble polymer; X is sulfur or selenium; n₁ and n₂ each are from 0 to 2; and n₃ is from 0 to 100.

54. A thioester or selenoester generator comprising an amino acid
 15 synthon having an N-terminal group joined to a C-terminal group through an organic backbone, wherein said C-terminal group comprises a backbone carbonyl of an ester chosen from a thioester and a selenoester that includes a water-soluble polymer, and wherein said amino acid synthon is joined to a support through a linker that is cleavable under non-nucleophilic conditions.

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55. A thioester or selenoester generator comprising a composition having the formula:



wherein PG is a protecting group that maybe present or absent, Y is a target molecule of interest and may be present or absent, and when Y is absent
 5 PG is an amino protecting group that may be present or absent; R_1 and each R individually is hydrogen or an organic side chain; R_3 is a water-soluble polymer; X is sulfur or selenium; n_1 and n_2 each are from 0 to 2; n_3 is from 0 to 100; each L_1 , L_2 and L_3 is a linker cleavable under non-nucleophilic conditions; and Support is a solid phase, matrix or surface; and wherein only one of L_1 , L_2 , and L_3 is present.

56. A method of making thioester and selenoester generator comprising a compound of interest, said method comprising:

(a) coupling a compound of interest to an amino acid synthon having an N-terminal group joined to a C-terminal group through an organic backbone,
 15 wherein said C-terminal group is joined to a water-soluble polymer through a thioester or a selenoester; and

(b) optionally, repeating said coupling one or more times with the same or different compound of interest.

57. A method for the chemical ligation of two components, said method comprising:

(a) contacting first and second components, wherein said first component comprises an amino acid synthon having an N-terminal group joined to a C-terminal group through an organic backbone, said C-terminal group
 25 comprising a carbonyl of a thioester or selenoester that is joined to a water-soluble polymer through said thioester or selenoester; and wherein said second

component comprises a nucleophile capable of reacting with said thioester or selenoester; and

(b) forming a reaction product having covalent bond between the carbonyl of said first component with the nucleophile of said second component.